Wind Energy on Long Island

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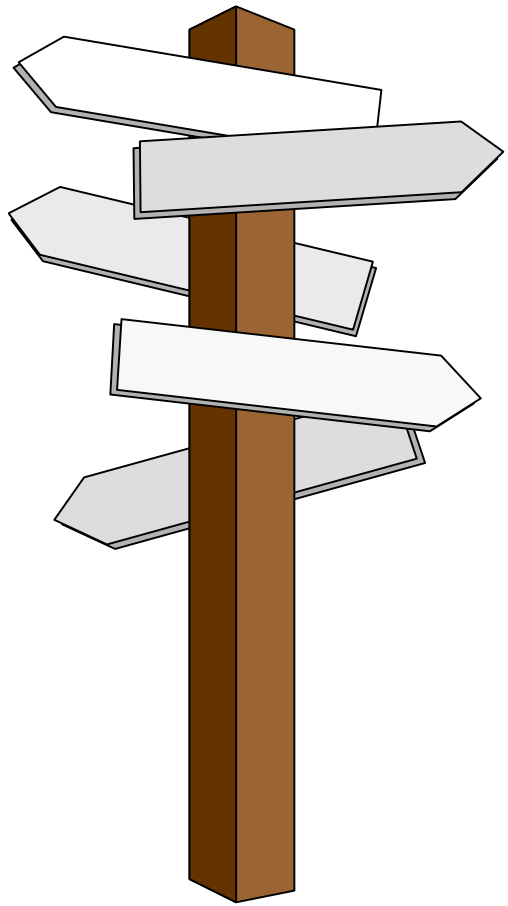
Discussion Topics

- Overview of wind energy
- Wind resources on Long Island
- Small vs. large wind turbines
- Case Studies
- Lessons Learned
- Future Plans (Off-shore)
- Discussion and Q&A



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Application Opportunities For NY

Small to moderate sized wind farms

Agricultural/residential/business systems

Hybrid & integrated systems

Offshore projects

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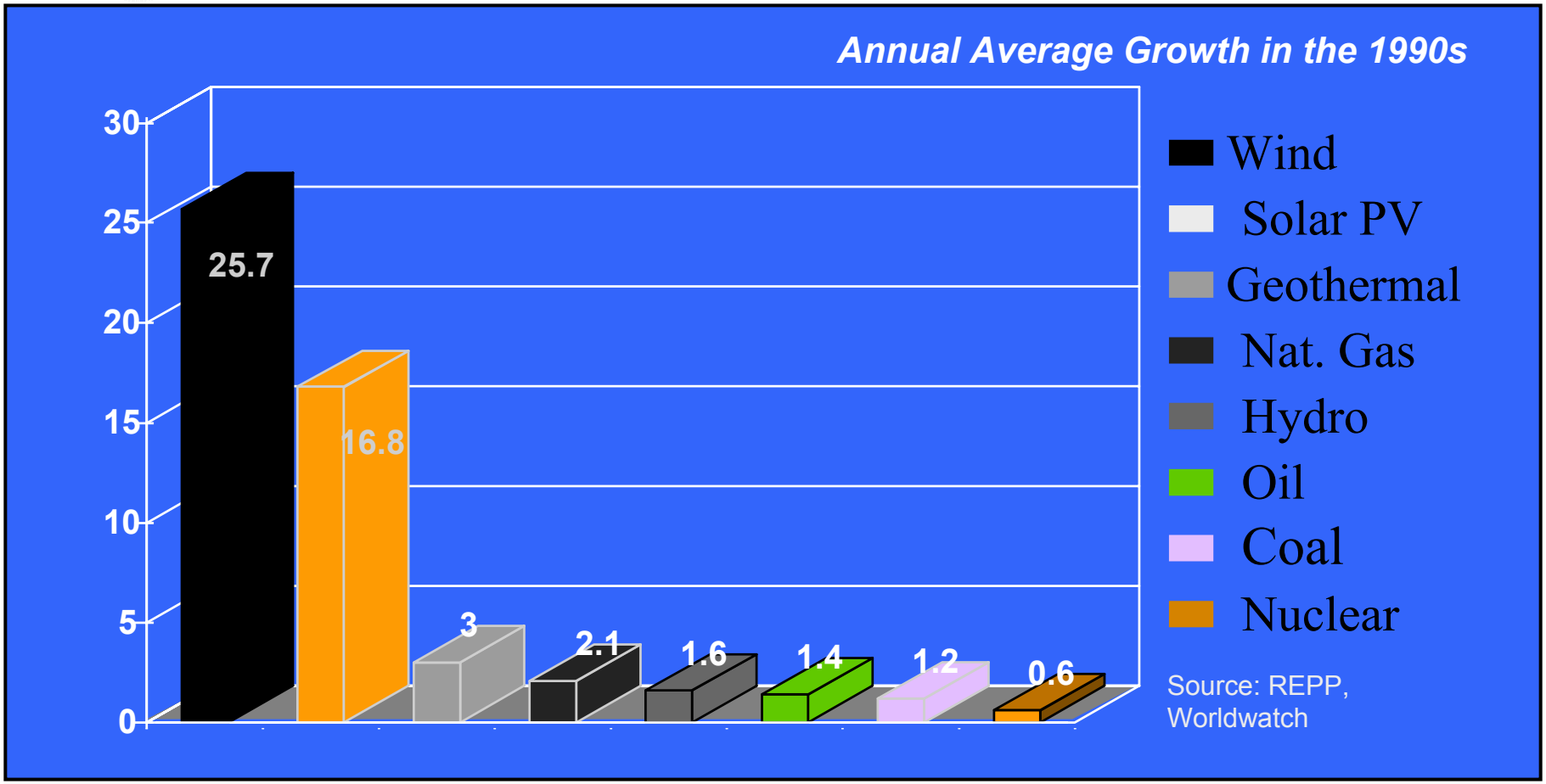
Global Growth of Energy Sources



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Wind Energy Status

- 4,500 MW installed in U.S.
  - » satisfying electricity needs for 4 million people
- >31,000 MW worldwide
- Turbine Availability Averages >98%
- Wind supplies 13% of Denmark's electricity
- Wind supplies over 20% of energy in some northern states of Germany and Spain

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Attributes of Wind Energy

- **Provides energy resource diversity**
  - » energy costs are stable over life of plant
  - » cost declined 90% in 20 years
  - » lowest cost renewable technology
- **Can be built quickly**
  - » scalable for large & small applications
- **Provides economic development**
  - » second “crop” to farmers
  - » reduces imports
- **Minimal environmental impact when properly sited**
  - » no emissions
  - » widely accepted by the public

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Air Quality Benefits

Wind is a clean, non-polluting energy source.

Emissions avoided over 20-year turbine life:

- **1.9 million lbs of CO_2**
- **6,500 lbs of SOx**
- **2,800 lbs of NOx**
- **260 lbs of particulates**

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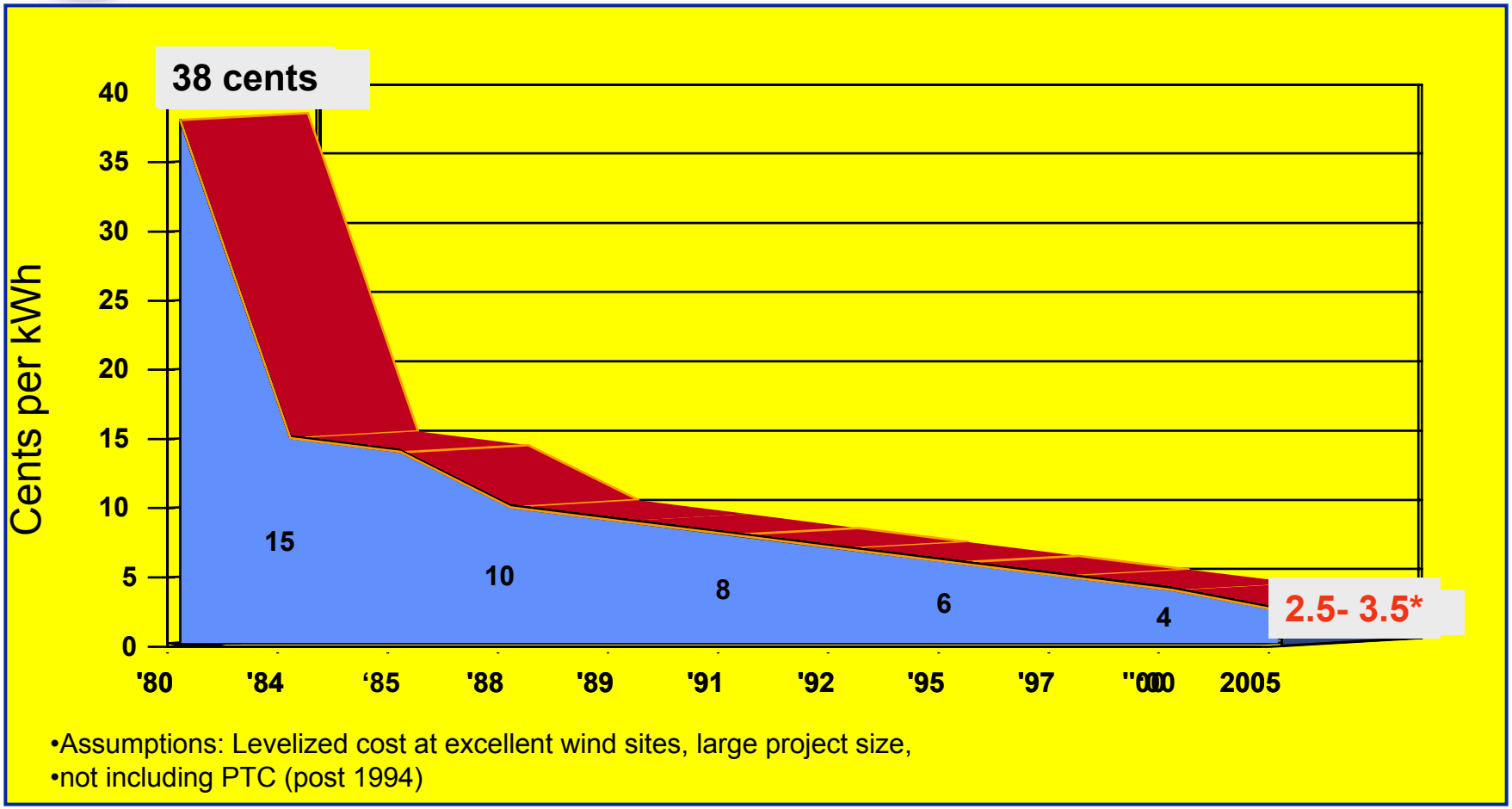
Decline in Wind Energy Costs



•Assumptions: Levelized cost at excellent wind sites, large project size,
•not including PTC (post 1994)

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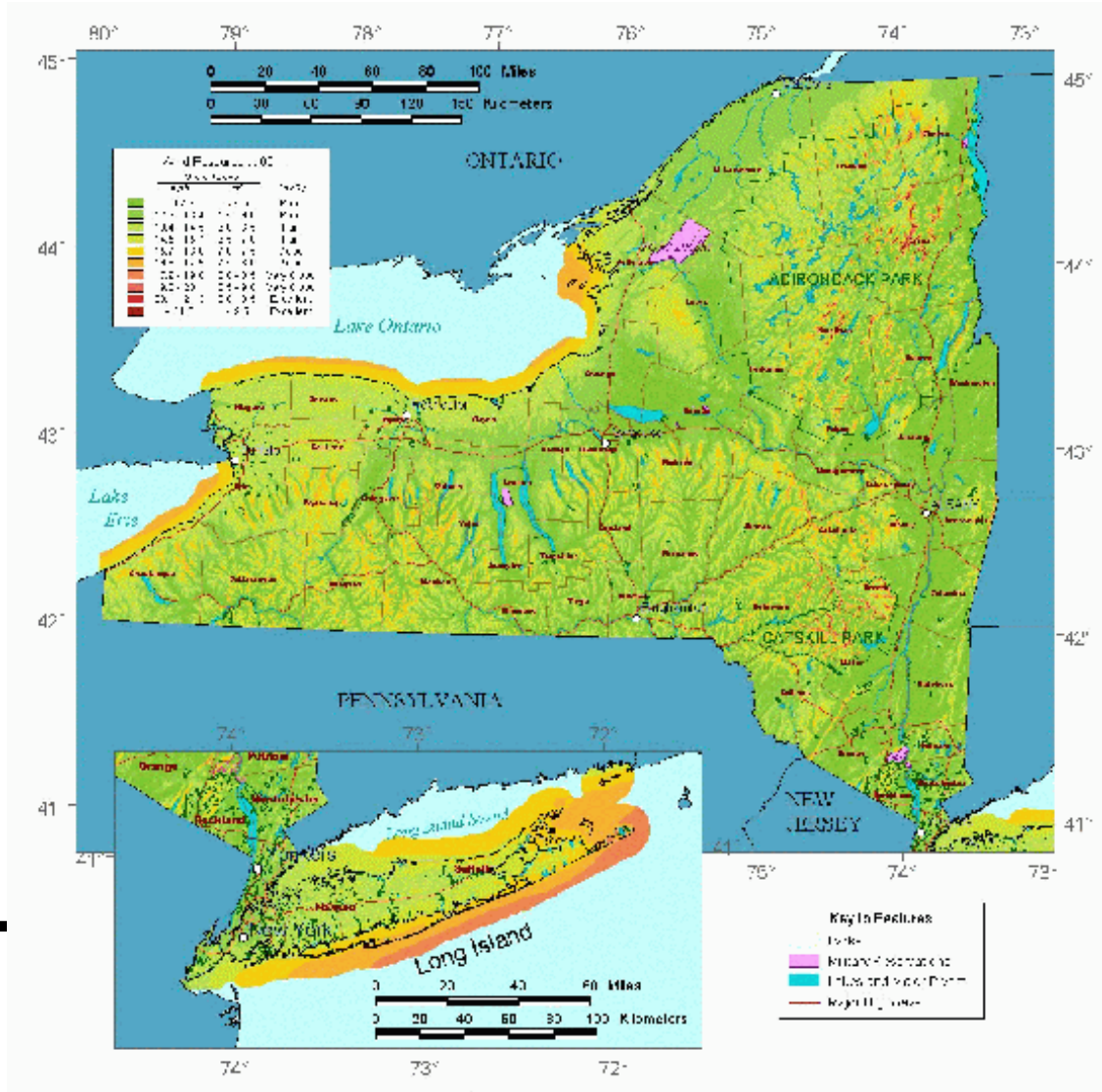
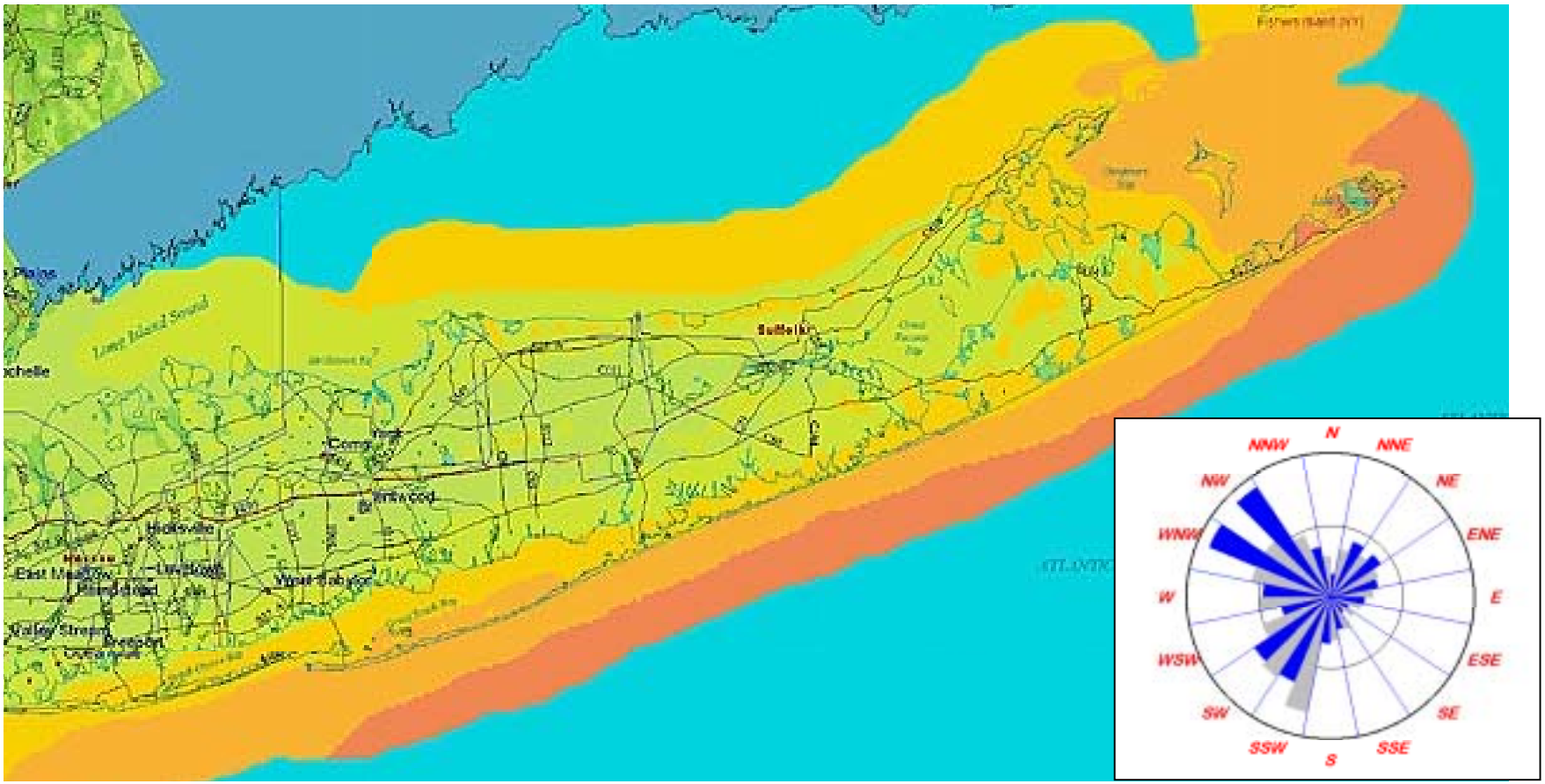
Determining a Site's Wind Resource

- Most counties contain windy sites
- NY Wind Map now available to help identify & qualify sites
- Map can be queried and magnified on web site
- www.truewind.com



Long Island's Winds



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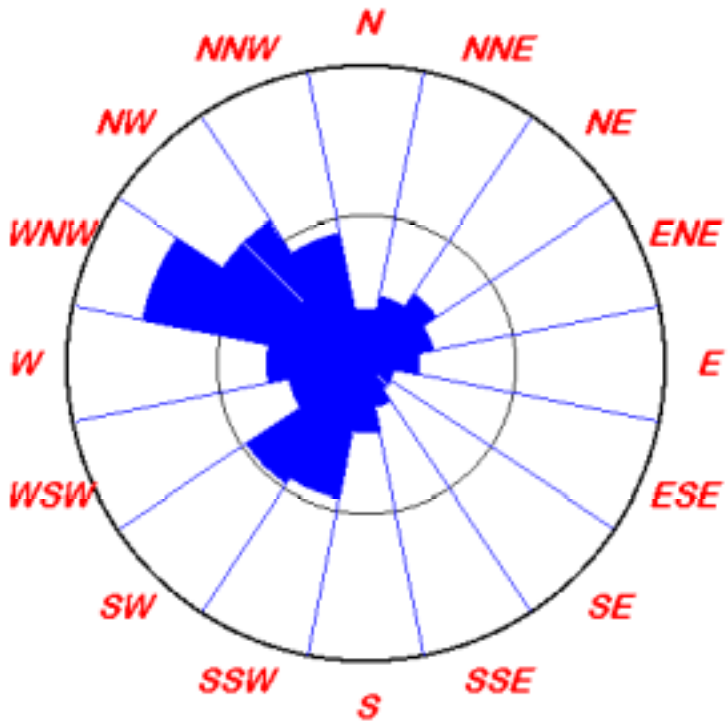
Wind Characteristics

- Speeds at well-exposed sites average 13 mph @ 100 ft
  - » 15.5 mph in winter
  - » 10.5 mph in summer
- NW & SW prevailing directions
- Peak winds in afternoon



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Large vs Small Scale Economics

Large Turbines

- ~ $1,000 / kW
- High Voltage Delivery
- Value of Power:

2-5¢

Small Turbines

- ~ $4,000 / kW
- Low Voltage Delivery
- Value of Power:

10-18¢

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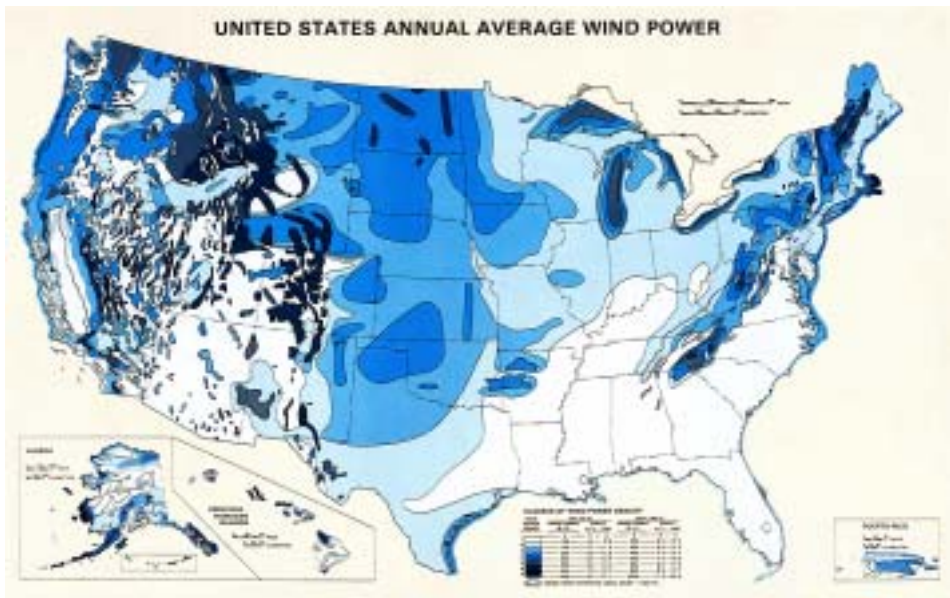
Small Turbines Require Less Wind

Large Turbines

- Require ~ Class 3-4 Wind Regime
- Prefer Class 5

Small Turbines

- Require ~ Class 2 Wind Regime



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Small Wind Turbine Technology

- Adaptable to multiple applications
  - » distributed generation
  - » residential, commercial, industrial
  - » on-grid & off-grid
  - » 400 W - 50 kW sizes
- Simple design, few moving parts
- Safe & reliable
- Low maintenance
- Dependable power quality
- Environmentally friendly

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Case Study - Southampton

Specifications:

- Bergey 10 kW turbine
- 100 ft self-supporting lattice tower
- Single phase 240V output

Issues:

- Permitting
- Performance
- Cost

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Case Study - Brookhaven

Specifications:

- Bergey 10 kW turbine
- 90 ft self-supporting tubular tower
- Single phase 240V output

Issues:

- Performance
- Cost

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Case Study - Calverton

Specifications:

- AOC 50 kW turbine
- 100 ft self-supporting lattice tower
- Three phase 480V output

Issues:

- Permitting
- Reliability
- Cost

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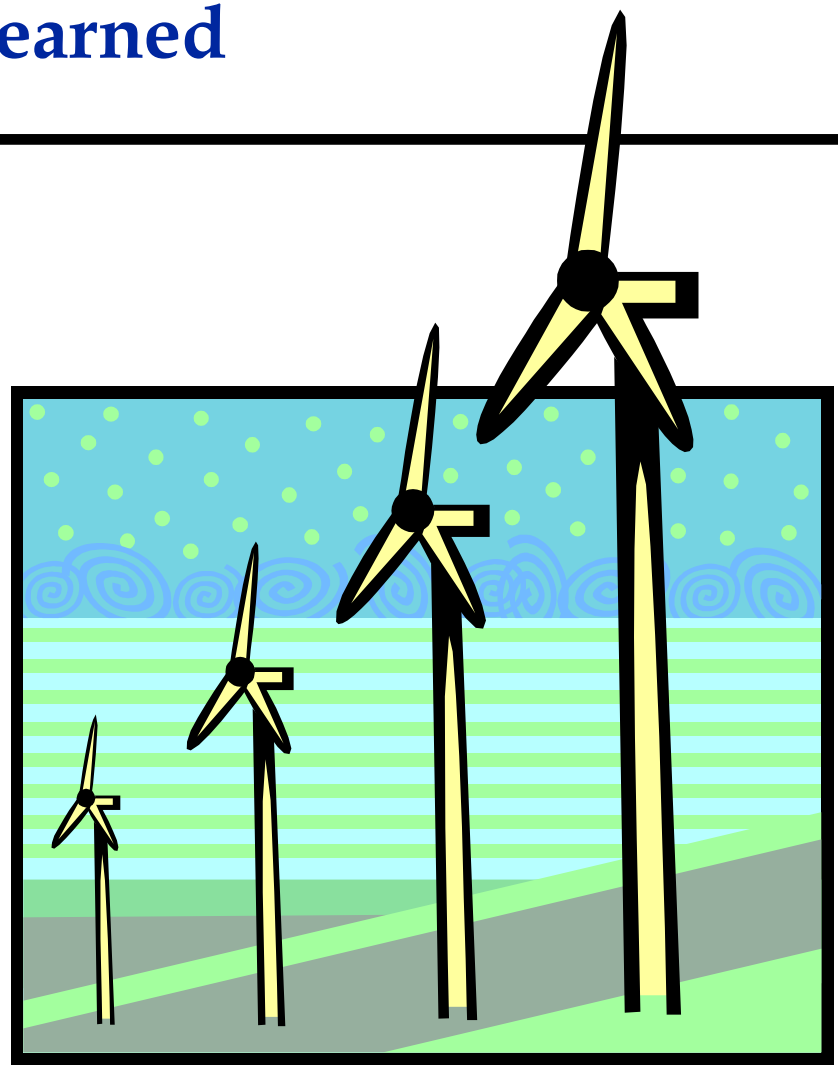
Lessons Learned

- Economies of scale matter
- Costs are higher than national average
- Permitting on Long Island is difficult



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Siting & Zoning Issues

Typical Issues:

- Height
- Visibility
- Sound
- Wildlife
- Public safety
- Land use
- Erosion
- Setbacks

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Photosimulations

Photosimulation

Actual Installation

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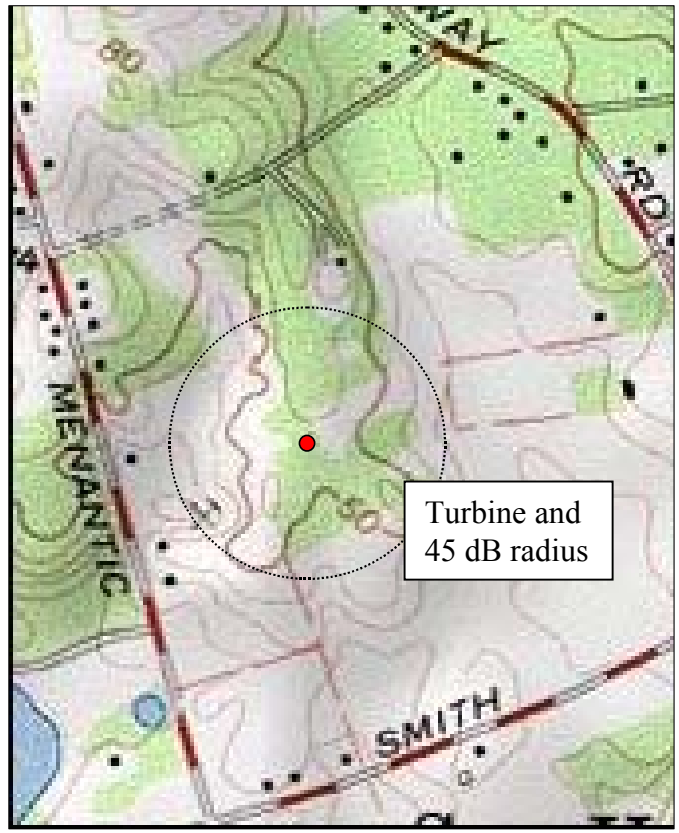
Acoustics

Typical Sounds

- orchestra = 80 dB
- conversation = 65 dB
- auto traffic @ 120 ft = 55 dB
- wind blowing through trees @ 40 ft = 50 dB
- average residence = 45 dB
- surf = 40-45 dB

⇨ **Turbine sound will be below background levels at nearest residences**



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